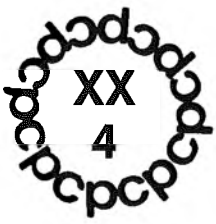
Planning & Changing



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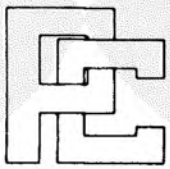

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TOWARD A SYNTHESIS OF INQUIRY ON ENVIRONMENTAL ROBUSTNESS[1]

While students often remark that school is boring, visits to schools or recollection of our own school days may not always substantiate this characterization. It would seem that the regimentation and routines associated with educators' interest in order and discipline do little to dispel the reputation of boring times for students. However, as noted fifteen years ago in *Planning & Changing* (Willower and Licata, 1975), school and classroom life can indeed be characterized by circumstances of high drama. According to Willower and Licata, variation in school/classroom structure may in fact be associated with variation in student/teacher perceptions of the drama of everyday life in schools.

Occasionally, reports of school life reminiscent of the initial interest in environmental robustness surface. Recently, one well publicized account appeared in a local newspaper (Lambert, 1988). Instead of the usual stories about school board politics, desegregation efforts and student achievement, this account highlighted the work of a successful mathematics teacher, one Jaime Escalante.

According to the account, Escalante—a bespectacled, 57 year-old, Bolivian native—teaches math to Latino teenagers in a poverty-ridden Los Angeles barrio choking on "crime, drugs and gangs." A former computer programmer with a passion for teaching, Escalante has students literally standing in line to get into his classes. To insure the placement of their children in his class, many parents have gone as far as to lie about their district address. Students who make it into Escalante's courses must agree to some unusual stipulations. For example, they must: be willing to attend school for four hours each Saturday; be prepared to stay late after school each day; expect to complete as much as thirty hours of homework each week; and, agree to take ten weeks of summer school.

Since the beginning of his teaching career in 1974, hundreds of Escalante's students have taken and passed the advanced placement calculus exam for college credit—an exam attempted by approximately one percent of high school juniors and seniors each year. According to Escalante's principal, Maria Tostado, "Jaime teaches ideas and concepts—not computation . . . . kids love the concepts. They really get excited about it."

An example of Escalante's approach and appeal is captured in his reference to the Los Angeles Lakers . . . "I tell them, 'rifle pass from Magic Johnson, the pass has to be in a straight line. That equals $y = mx + b$' (the formula for a y-intercept in a linear equation)." Escalante continues, "I want the kids to imagine how the pass is going. Every time I say '$y = mx + b$,' they think 'rifle pass from Magic Johnson.'"

Escalante's classroom, a former band rehearsal hall, is in many ways atypical. A child's seat reserved for tardy students sits at the front of the room. In addition, multiple "toys" used for illustrating concepts are found around the classroom. Conspicuous examples include a multicolored plastic chain with links of different lengths used to illustrate inequalities and a faded pillow with which to swat wayward students. Escalante sometimes separates his classes into groups of four

or five students. He then proceeds to select the weakest student in each group as leader. The group's task is to solve problems on the basis of the strategy outlined by the leader. According to Escalante, "What happens is, you start building the confidence of someone who is weak or doesn't have a good background. After a while, they start leading the discussion. Sometimes they even borrow my toys."

Since this teacher's story has been dramatized by Warner Bros. in the film "Stand and Deliver," there is always the possibility that the reporter was guilty of exaggeration. Certainly, educators might debate the wisdom of such strategies as swatting inattentive pupils, making weak students group leaders or giving thirty hours of homework per week. On the other hand, Jaime Escalante's story might be an example of a teacher who reorganizes classroom structure in such a way so as to stimulate and evoke the empathetic involvement of students through the creation of "classroom drama." Speculation regarding the presence, nature and description of this "drama" led Willower and Licata (1975) to identify such drama as "environmental robustness." What follows is a description, review, and synthesis of research that has emerged since the inception of environmental robustness as a construct.

Initial Speculation

Initial speculation and conceptualization of environmental robustness proved to be an unanticipated research consequence for Willower and Licata in 1975. While focusing on student and teacher attitudes regarding student challenges to school authority ("student brinkmanship," Licata 1974) and pupil-control behavior, the researchers noted an interesting disparity which emerged from the comparison of two schools. Whereas students from School A, a custodial-oriented school, were expected to have more negative attitudes about brinkmanship and everyday classroom life than students in School B, a humanistic school, the opposite proved to be true. Students in School A, the more custodial school, exhibited more positive attitudes about brinkmanship and everyday classroom life than students in School B, the humanistic school. While initially confounded by these findings, the researchers proceeded to explain this unanticipated disparity in terms of "environmental robustness." Robustness was defined as the perception of school drama produced by various tension-creating structures within the school. Willower and Licata speculated that the tension-creating structures found in School A, the traditional school, were perhaps more effective in evoking the empathetic involvement of students than those in School B.

To further elaborate their findings, Willower and Licata proceeded to identify tension-creating structures within schools. In traditionally oriented schools, they suggested, student-teacher conflict, final examinations or the "big game" stand as examples of tension-creation structures. It was the presence of tension-creating structures such as those in School A that accounted for its higher level of perceived robustness. The teachers in School B, on the other hand, proved more "open" or humanistic in their orientation. Willower and Licata suggested that the tendency of such schools to reduce conflict and competition by minimizing the effects of tension-creating structures functioned to create a less dramatic

environment for students. The absence of these tension-creating structures in the humanistic school reduced student opportunities for empathetic involvement and subsequent perceptions of robustness.

As can be deduced from these early descriptions, the use of theatrical terminology to define and describe robustness by Willower and Licata provides an important linguistic framework for conceptualizing environmental robustness. As applied to social situations, the theatrical analogy makes it possible to speak of social interaction in terms of actors, plots, settings and audience (Goffman, 1959). While evoking the heightened mental and emotional involvement of the audience, the presence of conflict within a play or novel creates within the observer a tension that seeks resolution. By creating and subsequently delaying its resolution, the skilled writer proves adept at using conflict to sustain the emotional involvement of the audience. As is the case with theatrical performances and literature in general, conflict is thought to be a central feature of any dramatic social situation. This type of role taking was noted long ago by Durkheim (1947) who suggested that the punishment of a crime often has a more important societal impact on the innocent than on the criminal.

Examples of such tension-creating scenarios and resultant empathetic involvement within the context of the school were noted by Willower and Licata. In a traditional but robust school, the student audience might regularly have the opportunity to take the role of a classmate who runs a risk or is embroiled in a conflict with a teacher. Fellow students "may feel frightened, wrestle symbolically in their seats during a close contest and sigh with relief as the issue is decided." Actual examples of tension-creating or robust structures within schools as noted by Willower and Licata (1975) include the integration of aviation lessons by a particular school into its curriculum for underachieving students, Coleman's (1961) proposed inter-school intellect competition, incorporation of the Outward Bound survival by schools, and virtuoso teaching performances.

Yet, in spite of the dramatic involvement created by these tension-creating structures, Willower and Licata recognized the negative consequences of these same structures. Repetition of even the most dramatic structure would over time, they note, become monotonous to an audience. Most professional entertainers seem to understand this limitation and skillfully utilize comic relief or novelty to hold their audiences. In schools, the changing of sports seasons, the humorous ways students sometimes circumvent authority, or elementary teachers use of Holidays such as Valentine's Day, Halloween, Lincoln's Birthday or Thanksgiving were thought to be possible examples of relief structures that reduce monotony. For Willower and Licata, the robust school is one in which conflict, monotony, and relief structures are found in the kind of balance that promotes variation and maintains audience involvement.

Willower and Licata (1975) recognized that their unanticipated finding and analysis was both speculative and highly tentative. Solid empirical evidence was absent for most of the thoughts advanced. However, they believed that the idea of environmental robustness was worthy of further inquiry. They suggested that the development of a viable operational definition for robustness might be a useful first step.

Operational Definition

Following conceptualization, Osgood's (1957) semantic differential was used by Licata and Willower (1978) to develop an environmental robustness measure. Twenty-five pairs of polar adjectives thought to be discriminators of "dramatic content" were selected. The sample for the initial development and testing of the instrument consisted of 136 elementary and secondary teachers, 200 high school and 136 elementary students. T-tests of individual item mean scores for the concepts "dramatic" and "not dramatic" and subsequent factor analysis of the responses to the remaining items led to the identification of a single factor accounting for 68% of the test variance. Test-retest reliability procedures resulted in a reduction of the measure to its final form, a 10 scale Robustness Semantic Deferential (RSD).

Operationally, environmental robustness was defined as respondents' perceptions that a particular concept was "interesting," "fresh," "meaningful," "important," "unusual," "powerful," "active," "thrilling," "action-packed" and "challenging" rather than "boring," "stale," "meaningless," "unimportant," "usual," "weak," "passive," "quieting," "uneventful" and "dull." The developers noted that almost any concept, for example, "my school," "my role as a teacher" or "this class," could be assessed using the ten RSD scales.

Eighty-four secondary students who had participated in the reliability experiments with the measure were asked to evaluate their schools on a scale using the pair "good-bad." As suspected, analysis revealed the mean RSD score for students holding a positive evaluation of their school was significantly higher than the mean RFD score for students holding a neutral or negative evaluation of their school (Licata and Willower, 1978).

Discussion of Subsequent Research

Contrary to initial speculation, the research findings from fifteen years of work with the RSD suggest that environmental robustness is positively related to the humanistic pupil control behavior of teachers and principals as well as a number of classroom and school characteristics often thought to be associated with quality work environments for principals, teachers and students. *Table 1* summarizes these findings.

As a way of describing possible themes that emerge from these studies, the following discussion uses key studies to address three issues: 1) rethinking the relationship between student perceptions of robustness and principal or teacher pupil control behavior; 2) analyzing the relationships between environmental robustness and its correlates; 3) cautions present in the findings that bode against assuming that perceptions of robustness are necessarily associated with effective classroom or school organization.

Pupil Control and Robustness

Findings in elementary (Multauf, Willower and Licata, 1978) and secondary (Estep, Willower and Licata, 1980) classrooms suggest that there is a relatively strong positive correlation between student perceptions of humanistic pupil control behavior and classroom robustness. In other words, when teachers treat students with consideration and as individuals capable of controlling their own

TABLE 1
Robustness Literature: Overview Of Studies
Individuals And Robustness

STUDY	SUBJECTS	SCHOOL	VARIABLES	RESULTS
A. STUDENTS				
Licata & Willower (1978)	students	elem/ sec	1. RSD-students 2. Students' perception of school.	Robustness correlates with + student perceptions of school.
Brown & Licata (1978)	students	elem	1. Pupil Control Behavior (PCB) 2. RSD-students of st. brinkmanship 3. RSD-students of teacher's PCB	Robustness correlates with + perceptions of brinkmanship but – perceptions of teacher PCB
Licata, Willower & Ellett (1978)	students	elem/ sec	1. RSD-students 2. School Climate 3. Principal performance	Robust schools have clear goals and objectives, are organized have diverse activities, etc.
Ortiz (1988)	students	elem	1. RSD-students perceptions of a CAI learning environment 2. Math learning and retention scores.	CAI classrooms were more robust than traditional classes. The learning and retention of math was also greater in CAI classes.
B. TEACHERS				
Ellett & Licata (1982)	teachers	elem/ sec	1. RSD-teachers 2. Teachers work environment attitudes	Perceived robustness correlates + with key + attitudes about school.
Morris (1986)	teachers	elem/ sec	1. RSD-teachers 2. Teacher alienation	The relationship between RSD and teacher alien. was not sig. A – corr was found between RSD and student retention.
C. PRINCIPALS				
Peregrine (1982)	prin	elem	1. RSD-prin. perception of own role 2. Leadership style of Principal 3. Principal effectiveness	A + relationship exits between a principal's RSD and his/her perceived effectiveness.
Eisenhauer, Willower & Licata (1985)	prin	elem/ sec	1. RSD-principals of their job 2. Role conflict 3. Role ambiguity	Robust principals tend to experience low role conflict & ambiguity in their positions.

TABLE 1 Cont.
Robustness Literature: Overview Of Studies
Classrooms And Robustness

STUDY	SUBJECTS	SCHOOL	VARIABLES	RESULTS
Multhauf, Willower & Licata (1978)	teachers	elem	1. Pupil Control ideology-teachers 2. Pupil Control Behavior-students 3. RSD-students	There is a - relationship between students' perceptions of robust schools and teachers' PCB.
Licata (1980) Estep, Willower & students	teachers	sec	1. Pupil Control Ideology-teachers 2. Pupil Control Behavior-students 3. RSD-students classes and teachers'	There are - relationships between students' perceptions of robustness PCB & PCI.
Licata & Wildes (1980)	students/	sec	1. Pupil Control Ideology-teachers 2. Pupil Control Behavior-students 3. RSD-students **(Field observations)**	Low robust classrooms are more routinized.
Gentry (1984)	teachers	sec/ college	1. RSD-students 2. teacher movement in classroom 3. instructional flexibility 4. teacher-student interaction	A pattern of behaviors as opposed to a single behavior determines classroom robustness.
			Schools and Robustness	
Smedley & Willower (1981)	students/ prin	elem/ sec	1. RSD-students 2. Pupil Control Behavior-principals	A - correlation between school robustness and principal's PCB.

Wyatt, O'Neill & Noth (1982)	all school particpants	elem	1. RSD-perspectives of all school particpants	RSD-measures are helpful for assessing organizational change
Jason (1987)	teach/prin	elem	1. RSD-principals 2. RSD-teachers 3. RSD-principal's predictions of teachers robustness perceptions. 4. RSD-teachers predictions of principal's robustness perceptions.	+ correlations between RSD principal and teachers' scores as well as RSD principal and teachers' ascribed scores.
Morris & Ellett (1987)	teachers mid/	elem/ sec	1. RSD-teachers 2. Teacher Job satisfaction 3. Student outcomes	+ correlations between RSD and teacher satisfaction Corr + between RSD and student achievement & attendance
Jason (1988)	teach/prin	elem	1. RSD-principals 2. RSD-teachers 3. perceptions of org. effectiveness	+ correlations between RSD, teachers & principals and perceived org. effectiveness
Street (1988)	teachers	elem	1. RSD-teachers 2. Teacher autonomy 3. Teachers' perceptions of supervisory expertise.	+ corr. between perceived auto & perceived supervisory expertise. + corr between robustness and perceived supervisory expertise.
Licata, Ellett & Johnson (1989)	teachers	elem/ mid/sec	1. RSD-teachers 2. Principal's Vision 3. Percept. of principal's performance 4. Teacher attitudes	+ correlations between RSD & multiple measures of the school environment and + perceptions of the principal's performance.
Licata, Greenfield & Tedlie (1990)	teachers	elem	1. Principal's Vision for school 2. RSD-teachers	+ corr between principal's articulation of vision & RSD.

behavior, students think these classes are interesting, challenging, meaningful or robust. In classrooms where teachers treat students with less personal consideration and impose coercive pupil control, students report that classroom life is dull, boring, meaningless or lacking in robustness. According to Smedley and Willpower (1981) there is a similar relationship between student's perceptions their principal's pupil control behavior and school robustness.

Field observations by Licata and Wildes (1980) in secondary classrooms varying in student perceptions of environmental robustness provide further insight into the relationship between pupil control behavior and classroom robustness. These researchers predicted the existence of an inverse relationship between environmental robustness and classroom routinization. Observation and comparison of classes identified as being high and low in robustness confirmed that teachers with custodial pupil control ideology and behavior regularly employed routinization in various aspects of classroom management, e.g. the delivering of instruction, caring for logistical concerns, and the enforcement of pupil control. For instance, such teachers tended to require that students sit down immediately upon entering the class and begin copying work from the blackboard or text. These routines were repeated day after day. In fact in one class, the teacher wore the same style and color trousers and shirt on a daily basis.

Conversely, in more robust classrooms, teachers tended to employ flexibility, variation, and even humor in dealing with daily instruction, classroom logistics, and pupil control. *Table 2a and 2b* contrasts the characteristics of these high and low robustness classrooms.

It is apparent from these studies that custodial pupil control behavior is associated with rigid classroom routines often characteristic of an environment students see as boring or less robust. While Willower and Licata (1975) were wrong about the relationship between pupil control and robustness, they were probably quite correct in their early speculation that student challenges to the teacher's authority in rigidly controlled classrooms would be relatively dramatic events evoking substantial empathy from the student audience. However, they appeared to have overestimated the frequency of such events in these classrooms. Instead, every day life in these classrooms is for the most part regimented, orderly, but less robust than the classrooms of teachers with relatively humanistic pupil control behavior.

Since Smedley and Willower (1981) found a similar relationship between principal pupil control ideology and behavior and student perceptions of school robustness, it appears reasonable to suspect that more custodial principals have a tendency to rigidly routinize school life. Further, more humanistic principals are less likely to employ rigid routinization and subsequently have their schools perceived by students as relatively robust.

While Willower and Licata (1975) were unable to explain the difference in the original two schools that inspired the robustness research, their conception of environmental robustness as a dynamic balance among tension-creating structure, monotony and relief structure appears to have implications for explaining the relationship between pupil control and robustness. Regardless of how challenging or exciting the task facing the student (tension-creating structure), in classrooms with strict pupil control the apathy produced by the daily repetition of events (monotony) and the apparent dismal prospect for variation and novelty (relief structure) combine to decrease the teacher's ability to maintain student

TABLE 2a
Characteristics Of High Robustness Classes

- Spontaneous student involvement in task, task activity would probably continue in the absence of the teacher.
- The teacher seems to be a moving, dynamic focal point for the class.
- The classroom appears to be a place for meeting with friends and where peer relationships among students are as integral a part of classroom interaction as relationships with the teacher.
- Student leadership seems to emerge naturally from the student group resulting in reduced status differentiation between students and teacher.
- The class atmosphere appears "shoplike," informal with students holding a degree of autonomy over their work space. The teacher consults rather than supervises.
- The teacher tends to "halo" expectations and attitudes about students and their work. Students are viewed as trustworthy and predominantly self-motivated.
- Students see the class as "fun" and look forward to attending it.
- Teachers tend to be more humanistic, less coercive, in pupil control ideology and behavior.
- The teacher tends to be flexible in administering classroom rules and regulations.
- The teacher is relaxed and confident and is likely to respond openly and in depth to student questions and even pursue the students' line of thought.
- The teacher's dress is varied, casual, sometimes colorful and appears to be a nonverbal clue of openness and the valuing of individuality.
- Students appear to move around freely either through "brinkmanship" patterns or through flexible classroom structure.
- Teacher displays a sense of humor, laughing, joking and badgering students; often calling students by nicknames.
- The students seem to express empathy, not only for one another but for classroom activity. This sometimes results in students "acting out."
- Student misbehavior is a low risk activity.

TABLE 2b
Characteristics Of Low Robustness Classes

- Student and teacher view much of task as a chore. It is doubtful that students would continue their work in the absence of the teacher.
- The teacher establishes a stationary position or focal point in front of the class.
- The teacher seems to dominate interaction in the class and there is very little opportunity for interaction among students.
- Teacher dominance tends to stifle student leadership and reinforce status differentiation between student and teacher. Social distance between teacher and student is strictly enforced.
- The class atmosphere is formal and autocratic stressing close supervision of student work by the teacher.
- The teacher tends to hold negative expectations and attitudes about students and their work. Teacher doubts student ability to be self-motivated.
- Students see the class as a "dull, boring routine."
- Teachers tend to be more custodial, less humanistic, in pupil control ideology and behavior.
- The teacher rigidly enforces rules and exceptions are rare or non-existent.
- The teacher seems to be on guard at all times, defending his domain, responding briefly or tersely to student questions.
- The teacher's dress is often uniform-like, unvaried and colorless. It tends to suggest standardization and impersonal relationships with students.
- Student movement is restricted. Brinkmanship, long pencil-sharpening trips, yawning openly, feigned confusion over assignments, allows student movement.
- Teacher remains expressionless, uses little humor and ignores the informal system of students.
- Emotional inhibition seems to be encouraged in the classroom. Student empathy with each other and classroom activity is at a minimum.
- Student misbehavior is a high risk activity.

empathy. As a result such classes are seen by students as less robust. In classrooms where the teacher emphasizes students' responsibility for their own behavior, flexibility in procedures, and support of spontaneity in student-teacher interaction, the possibility of tedium or boredom setting in is less likely. Such an explanation is reminiscent of a finding by Licata and Wildes (1980) that characterized robust classrooms in terms of spontaneous involvement by students in task. The researchers claimed that students in these classes would continue their work even if the teacher were to leave the room. In low robustness classes, students viewed their tasks as chores and were unlikely to continue in the teacher's absence.

Correlates of Robustness

Correlations between student, teacher or principals' perceptions of environmental robustness seem to suggest that dramatic classroom and school environments are characterized as follows: 1) clear goal structure; 2) friendly and supportive relationships; 3) diverse interests and activities; 4) active, visible leadership; 5) positive supervisory relationships with emphasis on opportunities for personal and professional growth; 6) student involvement; 7) learning and retention of learning, and; 8) principal and teacher belief in students' ability to be self governing and responsible in their behavior. This robustness theme seems to be present to a degree at the individual, classroom and school levels of analysis. While this theme paints a picture of a relatively inviting social environment, there is a need to try to understand why such environments are robust for the student, teacher or principal audience.

Perhaps the relationship among tension-creating structure, relief structure and monotony have meaning with respect to the correlational characteristics of environmental robustness noted above. For instance, environments characterized by friendly relationships, faith in the ability of others to be self governing and responsible, diverse interests and activities, and participative decision-making may represent the kind of social environment that nurtures spontaneity rather than tedium and predictability. When a school environment is friendly and multiple interests are free to express themselves, surprising and stimulating things are likely to occur. In such environments, patterning and repetition may be present to provide order but monotony is minimized by a healthy mix of tension-producing and relief structures.

Willower and Licata (1975) originally used the metaphor "school as theatre" to describe the structure giving rise to perceptions of drama or robustness. Given the findings to date we may want to consider a revision of this metaphor. Robust schools and classrooms seem to be reminiscent of theatre which employs the play within a play technique as a means toward the enhanced involvement of the audience.[2] Allan Kaprow's creation of "happenings" (see Croyden, 1974 for a helpful description) or Dale Wasserman's (1965) adaptation of Cervantes' Don Quixote as the *Man of La Mancha* are recent examples of this kind of theatre. Recall that in *Man of La Mancha* Cervantes is imprisoned during the Spanish Inquisition and enacts the story of Don Quixote using his fellow prisoners as both audience and actors. While Cervantes outlines the plot for his fellow prisoners, he encourages them to improvise their roles as they see fit. By taking the role of both actors and audience, the prisoners tend to facilitate empathic

involvement by the larger audience. On the other hand Kaprow's early experiments with "happenings" went even further by actually involving the larger audience as actors.

As is often the case in such theatrical productions and possibly in robust schools or classrooms, the staging of a play within a play provides actors with whom the audience can truly empathize (actual members of the audience) as well as opportunities for spontaneity and improvisation. When a principal involves teachers in school decision making, their involvement provides a focus for empathic role taking for both the teachers involved and the remainder of the faculty. Further, when the process is friendly and supportive, teachers as well as principals are likely to say just about anything. The same is likely for teachers and students in classrooms. It is probably more difficult for students to empathize with a teacher making a presentation than it is for them to empathize with a student work group actively involved in resolving a stimulating problem or challenge. In such student work groups, new ideas, humorous remarks, mistakes, challenges of past practices, and interesting personal anecdotes are possible. Some individuals might debate, expand or improve on another's thoughts. In such an atmosphere, diverse interests and activities may often lead interaction down unanticipated avenues. In the same sense Willower and Licata's (1975) speculation about Outward Bound, aviation, and work-study classes as well as Licata and Wildes' (1980) description of robust classrooms might be understood in terms of the larger school context as examples of plays within plays in which audience involvement leads to spontaneity, improvisation, and enhanced student empathy.

Some Cautions

It is probably important to recall that high drama or robustness can be characteristic of schools and classrooms in which formal leadership is in dispute and where there are regular student challenges to authority (Licata and Wildes, 1980). Such settings are "three ring circuses of student brinkmanship." Conventional wisdom in schools often associates these situations with beginning teachers or substitutes. In such settings the notion of a play within a play seems applicable. There are multiple possibilities for spontaneous student involvement, improvisation and student and teacher empathy. Keeping such cases in mind it is important to understand that robust schools and classes are not necessarily effective ones. Schools and classrooms characterized by robustness *and* legitimate professional leadership are clearly the most promising in terms of desired student outcomes.

Many students love monster movies; few would want to meet a real monster. Monster movies are probably robust events for most students—almost as robust as if there were a real monster loose in the theatre. The first case allows students to empathize with certain actors, spontaneously interact with one another about dramatic events in the movie, and to enjoy the subsequent improvisation of themselves and other members of the audience. Within such a context, students are able to do these things safely. The second case provides the same kind of experiences without audience safety.

Outward Bound classes in which students are involved in wilderness survival training or some high school athletic contests stand as examples of relatively safe and robust, student risk-taking experiences. Friendly and supportive school/

classroom environments likewise allow for safe robust student-teacher interaction. Ideas can be presented and exchanged, challenges met, and problems solved without fear of being put down, hurt or humiliated. While it is certainly true that not all robust environments provide for relative audience safety, we should not be surprised that robust *and* safe environments are often associated with effective educational practice.

Morris and Ellett (1987) found that teacher perceptions of school robustness were positively correlated to student achievement and attendance. Teacher job satisfaction was not as strongly correlated. As suggested in many studies in other organizational contexts, job satisfaction by itself may be an inadequate predictor of educational effectiveness. Robustness on the other hand seems to capture both teachers' positive sentiments *and* empathy about their work environment. This difference may be important in nurturing student learning schools.

Toward A Synthesis

In attempting to synthesize research findings, this review has focused attention on broad themes rather than comprehensive explanations. Clearly by doing so certain findings and anomalies may have been overlooked. For instance, the finding by Morris (1986) that teacher perceptions of robustness and school level retention of students were negatively related might invite some rethinking of the discussion presented above. Rather than wrestling with such issues further however, the remainder of this section focuses on the definition of environmental robustness as the key vehicle for synthesis in this paper. The definitions which follow are given in an attempt to further illuminate the construct.

Structure is defined here as the routine or typical ways organizations go about doing things. Examples might be the hierarchical ordering of roles or social positions (such as principal, teacher, student), the curriculum and the processes used in teaching students, the rhythm and events tied to the school calendar or extracurricular activities.

Initial speculation about robustness suggested that various forms of conflict produced audience perceptions of drama and subsequent empathy. There is evidence to suggest that conflict continues to be a useful means of understanding robustness. However, findings that suggest that robustness can also be understood in terms of spontaneous involvement in task or open and challenging interaction may bode for the use of a concept that includes conflict but with broader meaning. We believe that *dissonance* might be that concept.

Dissonance is simply a state of conflict and/or disharmony. Implicit in the use of dissonance is the audience need for resolution. Resolution may take many forms. Examples include the felt need to: 1) seek the solution to a vexing problem; 2) settle a dispute or contest; 3) satisfy one's curiosity, or; 4) predict an outcome. Great musical composers often employ dissonant chords or passages in their works to evoke audience curiosity about how the incompleteness or disharmony will be resolved. At an athletic contest, the perception of dissonance among contestants often causes the spectators to sit on the edge of their seats and emotionally voice their hope for the outcome to be resolved in favor of their team.

Dissonance structures (previously called tension-creating structures) are the typical ways schools produce student perceptions of conflict or disharmony.

Such structures might be understood in terms of final examinations, graduation exercises, athletic contests, vocational education programs or even survival training (Willower and Licata, 1975). Other examples suggested by our review of robustness research might include instructional tasks that focus on student problem solving, principal leadership or vision, teacher involvement in decision making, supervision practices that present opportunities for professional growth, and clear and challenging goal structure.

Monotony is a collective feeling of apathy associated with excessive patterning and repetition of school structure. Recall the initial enthusiasm of school band members on the first day of the practice and the subsequent fatigue and tedium in their expressions after two weeks of repetition and drill. In some schools children claim enthusiasm during the first days of school. After three months of daily regimentation with lessons and other activities, many become bored and look forward to holidays or summer. Uninterrupted patterning and repetition of even the most exciting activity eventually leads to student or teacher or principal perceptions of lethargy, indifference or apathy.

Relief structures are the typical ways schools reduce or eliminate monotony. Teachers might occasionally change from lecture to small group instruction, use novel aids and materials or a sense of humor or exhibit flexibility in changing the pace or order of instruction as student interest begins to wane. Such relief structure tends to reduce the unanticipated negative consequences of classroom organization. The same might be said of principals or supervisors who typically do the same kinds of things in staff development workshops with teachers. As noted previously, the change of sports seasons or elementary teachers use of various holidays in teaching may also be examples of relief structure employed to maintain student empathy.

Environmental robustness is the perceived dramatic content of school structure. It might be understood in terms of the following equation:

Environmental Robustness (ER) = Dissonance Structure (D) / the ratio of Monotony (M) to Relief Structure (S)

or

$$\mathbf{ER = D / (M/R)}$$

Simply stated, the level of tension due to dissonance structure tends to be diminished by feelings of monotony; feelings of monotony tend to be diminished by relief structure. Teachers in robust classrooms probably present instruction in ways that challenge students to resolve the disparity between their present level of achievement and instructional objectives (D). They maintain student empathy by careful avoidance of classroom organization becoming an end in itself (M). Like Escalante, they vary the schedule, use humorous or novel examples, nurture diverse points of view and emphasize application of concepts (R). Principals of robust schools may be successful in challenging faculty to resolve the disparity between their present performance and a shared vision of what the school should and ought to be (D). In accomplishing this, they are careful to organize with a light touch so that teacher flexibility, innovation and improvisation prevail (R) over rigid reliance on familiar routines (M).

Conclusion

The above discussion and examples are presented merely for illustrative purposes. There is no intent to characterize the relationships that may enhance environmental robustness in terms of simple mechanical manipulation of variables. Every day life in schools is far too dynamic and complex to emphasize such an approach. Certainly, the research to date is probably best understood as seminal work with much left to do.

The definitions and equation presented are offered only as conceptual guides to stimulate thinking about environmental robustness. With this in mind, our approach has emphasized the development of ideas over the systematic criticism of specific studies. Perhaps some may view these ideas as useful starting points for new inquiry. The least we might expect from such inquiry is a better understanding of why some students and teachers claim that school is sometimes boring. At best we might hope for a time when we have the wisdom to make schools more effective and robust places for students and professional staff alike.

Notes

1. This is a revised version of an invited address to the Special Interest Group on Learning Environments, Annual Meeting of the American Educational Research Association, San Francisco, California, March 27, 1989.
2. The authors wish to acknowledge Joseph Claudet for his assistance in developing the "play within a play" metaphor.

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